(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
9 November 2006 (09.11.2006)

PCT

(10) International Publication Number
WO 2006/118755 A2

(51) International Patent Classification:
H04Q 7/22 (2006.01)

(21) International Application Number:
PCT/US2006/013404

(22) International Filing Date: 11 April 2006 (11.04.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/120,324 2 May 2005 (02.05.2005) US

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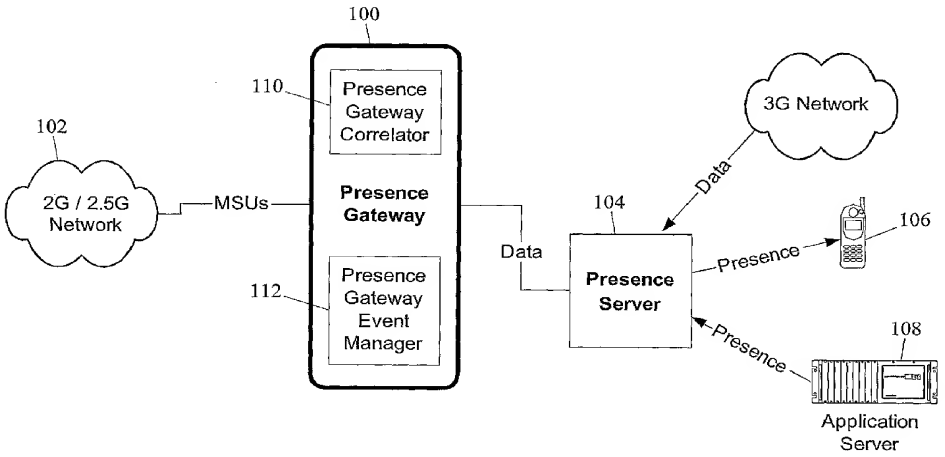
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

[Continued on next page]

(54) Title: METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR DYNAMICALLY COORDINATING COLLECTION AND DISTRIBUTION OF PRESENCE INFORMATION



(57) Abstract: Methods, systems, and computer program products for dynamically coordinating collection and distribution of presence information are disclosed. According to one method, presence information is collected for a presentity. An event manager is selected from a plurality of event managers and is dynamically assigned to the presentity. The presence information is then communicated to the assigned event manager.

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DESCRIPTION

METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR DYNAMICALLY COORDINATING COLLECTION AND DISTRIBUTION OF PRESENCE INFORMATION

RELATED APPLICATIONS

This application claims the benefit of U.S. Patent Application Serial No. 11/120,324, filed May 2, 2005, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The subject matter described herein relates to collecting and distributing presence information. More particularly, the subject matter described herein relates to methods, systems, and computer program products for dynamically coordinating collection and distribution of presence information.

BACKGROUND ART

Presence information is increasingly being collected in telecommunications networks in order to provide value-added services to telecommunications subscribers. Presence information refers to information regarding the reachability, location, communication terminal status, preferred contact mode, available contact modes, and/or other aspects associated with contacting a telecommunications subscriber. Such information may be collected so that an application or another subscriber can contact and communicate with the subscriber.

The subscriber about whom presence information is being collected is referred to as a presentity. Presence information regarding the presentity is stored by a presence server. When another subscriber or application seeks to contact the presentity, the subscriber or application subscribes to the presentity by sending a subscription message to the presence server. Once the presence server accepts the subscription, the presence server will communicate presence information regarding the presentity to the subscriber or application. When the status of the presentity changes, the presence server will

automatically communicate changes in status to the subscribing application or subscriber.

In 3G communications networks, end user devices, such as GPRS handsets, include presence clients that automatically maintain presence information for subscribers and communicate the presence information to a presence server. In 2G and 2.5G networks, end user devices are typically not capable of maintaining or communicating presence information to a presence server. However, since 2G and 2.5G network subscribers represent a large percentage of subscribers, it is desirable to collect or derive presence information regarding these subscribers. Commonly-assigned, co-pending U.S. patent application no. 11/077,711 filed March 11, 2005, the disclosure of which is incorporated herein by reference in its entirety, discloses a presence gateway that automatically derives presence information regarding subscribed-to and non-subscribed-to presentities and delivers the information to a presence server. The presence gateway includes a correlator that correlates signaling messages and derives presence information and an event manager that receives the presence information from the correlator and sends the presence information to the presence server. The event manager receives subscriptions from the presence server and communicates changes in presence information for subscribed-to presentities to the presence server.

As applications that require presence information become increasingly popular, it is desirable to scale the presence gateway architecture to correlate presence information for increasingly large numbers of subscribers. In order to accommodate increasingly large numbers subscribers, multiple presence gateways with multiple correlators and multiple event managers may be used. One problem associated with using multiple correlators and multiple event managers is that the correlators and the presence servers must know the location of the event managers containing presence information for particular subscribers. One potential solution to the problem is to statically configure each correlator and presence server with a location of the event manager with presence information for each subscriber. Statically configuring the correlators and presence servers with the location of the presence information for each

subscriber is cumbersome and requires manual re-provisioning as new subscribers are added to the network.

Accordingly, in light of the problems associated with collecting and distributing presence information, there exists a need for improved methods, systems, and computer program products for coordinating collection and distribution of presence information.

SUMMARY

According to one aspect, the subject matter described herein includes a method for dynamically coordinating collection and distribution of presence information. The method includes collecting presence information for a presentity. The presence information may include any of the types of presence information described above, signaling messages relating to communications involving the presentity, and/or signaling message parameters from which contact information may be derived for the presentity. A presence gateway event manager is dynamically assigned from a plurality of event managers to the presentity. Once the event manager is assigned, the presence information is transmitted to the assigned event manager.

According to another aspect of the subject matter described herein, a system for dynamically coordinating collection and distribution of presence information is disclosed. The system includes at least one correlator for receiving telecommunications signaling messages and for deriving presence information regarding a presentity from the signaling messages. A plurality of presence server event managers receives the presence information and communicates the presence information to a presence server. An event manager coordinator dynamically assigns one of the event managers to receive the presence information for the presentity. The event manager coordinator may also inform a presence server of the event manager assigned to the presentity in response to a subscription request regarding the presentity from the presence server.

The subject matter described herein can be implemented using hardware, software, firmware, or any combination thereof. In one implementation, the subject matter described herein includes a computer

program product comprising computer executable instructions embodied in a computer readable medium. Exemplary computer readable media suitable for implementing the subject matter described herein include memory devices, such as chip memory devices and disk storage devices, application specific integrated circuits, programmable logic devices, downloadable electrical signals, or any other medium capable of storing computer executable instructions or logic implementations thereof. In addition, a computer program product that implements all or a portion of the subject matter described herein may be distributed across multiple physical devices or network nodes.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the subject matter described herein will now be explained with reference to the accompanying drawings of which:

Figure 1 is a network diagram illustrating an exemplary presence gateway architecture;

Figure 2 is a network diagram illustrating a presence gateway architecture including a single presence gateway event manager;

Figure 3 is a network diagram illustrating multiple presence gateway event managers that are assigned pre-provisioned ranges of subscribers;

Figure 4 is a network diagram illustrating a presence gateway architecture including an event manager coordinator according to an embodiment of the subject matter described herein;

Figure 5 is a flow chart illustrating exemplary steps for dynamically assigning a subscriber to an event manager based on a query from an MSU source according to an embodiment of the subject matter described herein;

Figure 6 is a flow chart illustrating exemplary steps for dynamically assigning a subscriber to an event manager based on a subscription attempt from a presence server according to an embodiment of the subject matter described herein;

Figure 7 is a network diagram illustrating exemplary messages exchanged between an event manager coordinator, a presence server, and presence gateway event manager in locating a presence gateway event

manager assigned to a subscriber according to an embodiment of the subject matter described herein;

Figure 8 is a network diagram illustrating exemplary messages exchanged between a message correlator, an event manager coordinator, and presence gateway event managers in locating a presence gateway event manager assigned to a subscriber according to an embodiment of the subject matter described herein;

Figure 9 is a message flow diagram illustrating exemplary messages exchanged between a message correlator, an event manager coordinator, and an event manager in assigning an event manager to a subscriber and delivering presence information to the event manager for a previously unassigned subscriber according to an embodiment of the subject matter described herein;

Figure 10 is a message flow diagram illustrating exemplary messages exchanged between a message correlator, an event manager coordinator, and an event manager for a subscriber for whom presence information is not collected according to an embodiment of the subject matter described herein;

Figure 11 is a message flow diagram illustrating exemplary messages exchanged between a message correlator, an event manager coordinator, and an event manager for a previously assigned subscriber according to an embodiment of the subject matter described herein;

Figure 12 is a message flow diagram illustrating exemplary messages exchanged between a presence server, an event manager coordinator, and an event manager in subscribing to presentity data maintained by the event manager according to an embodiment of the subject matter described herein; and

Figure 13 is a message flow diagram illustrating exemplary messages exchanged between an operator, an event manager coordinator, event managers, and presence servers, in rebalancing the load among existing event managers when a new event manager is added to the network according to an embodiment of the subject matter described herein.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 is a network diagram illustrating a presence gateway that collects and distributes presence information. Referring to Figure 1, presence gateway **100** receives messages from 2G/2.5G network **102** and delivers presence information to presence server **104**. Presence server **104** delivers presence information to entities that subscribe to receive presence information, such as handset **106**. Presence server **104** also receives presence information from an application server **108**. In the illustrated example, presence gateway **100** includes a presence gateway correlator **110** for receiving the messages, correlating the messages, deriving presence information regarding subscribed-to and non-subscribed-to presentities, and generating presence information. Presence gateway event manager **112** receives the presence information and delivers the presence information to presence server **104**.

Because presence information can be derived from many different signaling messages exchanged between different network elements, messages relating to a particular subscriber are preferably processed by the same event manager. One advantage of having a single event manager process presence information for a subscriber is that a complete presence profile can be deduced for a subscriber.

Figure 2 is a network diagram illustrating a single presence gateway event manager receiving messages from presence gateway correlators in different locations. In the illustrated example, presence gateway correlators **110** may be located at or near MSCs **200**, HLRs **202**, SMSCs **204**, and SCPs **206**. Presence gateway correlators **110** may be internal or external to the nodes that they monitor. In one exemplary implementation, presence gateway correlators **110** are located external to the nodes being monitored. Each node being monitored may have an internal or external message copy function that sends copies of signaling messages to presence gateway correlators **110**.

In large networks, it may be desirable to collect and distribute presence information for millions or tens of millions of subscribers. In order to scale presence gateway **100** to meet this demand, it may be desirable to add multiple event managers **112**. Figure 3 illustrates this architecture. In Figure 3, presence gateway event managers **112** are each statically assigned to specific

ranges of subscribers. The ranges of subscribers may correspond to subscriber identifiers, such as subscriber directory numbers. One problem with statically allocating ranges of subscribers to event managers is that periodic re-allocation must be manually performed when the number of subscribers grows, when new subscriber numbers are added to a network, or when new event managers are added to a network. Accordingly, the approach for allocating subscribers to event managers using pre-provisioned directory number ranges illustrated in Figure 3 is undesirable.

According to an aspect of the subject matter described herein, an event manager coordinator dynamically assigns subscribers to event managers. Figure 4 is a network diagram illustrating a presence gateway architecture including an event manager coordinator that dynamically assigns telecommunications network subscribers to presence gateway event managers according to an embodiment of the subject matter described herein. Referring to Figure 4, event manager coordinator **400** receives resource utilization data from presence gateway event managers **112**. Based on the resource utilization data, presence gateway event manager coordinator **400** dynamically assigns presence gateway event managers **112** to subscribers. For example, event manager coordinator **400** may receive requests from presence gateway correlators **110** for the location of event managers **112**. If the subscriber is currently assigned to an event manager, event manager coordinator **400** will respond with the location of the event manager that currently holds the subscriber record. If the subscriber is not currently assigned to a particular event manager, event manager coordinator **400** may allocate an event manager based on the resource utilization data. Once presence gateway correlators **110** receive the location information for a subscriber record, presence gateway correlators **110** may send presence information directly to the event manager.

According to another aspect of the subject matter described herein, event manager coordinator **400** may allocate a presence gateway event manager **112** in response to receiving a subscription request from presence server **104**. For example, if event manager coordinator **400** receives a subscription request from presence server **104**, event manager coordinator **400**

may respond with a location of the presence gateway event manager **112** currently assigned to the subscriber, if an event manager has been assigned. If an event manager has not been assigned, event manager coordinator **400** may dynamically allocate an event manager based on the resource utilization data and communicate the identity of the event manager to presence server **104**.

Figure 5 is a flow chart illustrating exemplary steps for dynamically assigning a subscriber to an event manager according to an embodiment of the subject matter described herein. Referring to Figure 5, in step **500**, a message source queries presence gateway coordinator **400** for the location of a subscriber record. The message source may be a message correlator **110**. In step **502**, event manager coordinator **400** retrieves a subscriber mapping record. The subscriber mapping record may indicate whether or not a subscriber is currently assigned to an event manager, and, if the subscriber has been assigned to an event manager, the identity of the event manager. The subscriber mapping record may be stored in subscriber mapping database **504**.

In step **506**, event manager coordinator **400** determines whether the subscriber has already been assigned to an event manager. If the subscriber has already been assigned to an event manager, control proceeds to step **508** where the assigned event manager IP address is returned.

If the subscriber has not already been assigned to an event manager, control proceeds to step **510** where the event manager that is least busy is located. This step may be performed by analyzing event manager utilization statistics **512**. Once the least busy event manager is located, control proceeds to step **514** where that event manager is selected and the subscriber mapping database **504** is updated to reflect the newly assigned mapping. In step **516**, event manager coordinator **400** returns the IP address of the newly assigned event manager.

As stated above, event managers may also be dynamically allocated when a presence server sends a subscription message for a particular subscriber. Figure 6 is a flow chart illustrating dynamic event manager allocation based on a presence server subscription attempt according to an embodiment of the subject matter described herein. Referring to Figure 6, in step **600**, a presence server sends a subscribe message to event manager

coordinator **400**. In step **602**, event manager coordinator **400** retrieves a subscriber mapping record from subscriber mapping database **504**. In step **604**, event manager coordinator **400** determines whether the subscriber is already assigned to an event manager. If the subscriber is already assigned to an event manager, control proceeds to step **606** where a SIP redirect message is sent to the presence server to redirect the presence server to the event manager containing the presence information for the subscriber.

In step **604**, if the subscriber is not already assigned to an event manager, control proceeds to step **608** where event manager coordinator **400** locates the least busy event manager. In step **610**, event manager coordinator **400** updates subscriber mapping database **504** with the event manager assigned to the subscriber. Control then proceeds to step **612** where a SIP redirect message containing the event manager IP address is sent to the presence server.

Once an event manager has been assigned to a presentity based on a presence server subscription request, as illustrated in Figure 6, the steps illustrated in Figure 5 may be performed to notify a message correlator of the event manager assigned to the presentity. That is, the correlator may query presence gateway coordinator **400** for the location or identity of the event manager assigned to a presentity, and presence gateway coordinator **400** may respond with the location of the event manager assigned based on the presence server subscription request.

Figure 7 is a network diagram illustrating exemplary messages exchanged between event manager coordinator **400** and a presence server in allocating a subscriber to an event manager in response to a subscribe message from a presence server. Referring to Figure 7, in step A, presence server **104** sends a subscribe message to the IP address of event manager coordinator **400**. In step B, event manager coordinator **400** redirects the subscribe message to the IP address of the appropriate event manager **112**. As stated above, if the subscriber has not been previously assigned to an event manager, event manager coordinator **400** may dynamically assign an event manager based on event manager utilization information. If the subscriber has

been assigned to an event manager, event manager coordinator may redirect presence server **104** to the appropriate event manager.

In step C, presence server **104** sends a redirected subscribe message to an event manager agent **700** of the assigned event manager **112**. Presence server **104** may optionally cache the subscriber location returned by event manager coordinator **400**. Subsequent subscribes to the same subscriber may be sent to the same presence gateway event manager **112**, as indicated in step D.

As stated above, event manager coordinator **400** may dynamically allocate an event manager for a subscriber in response to the query from a message correlator. Figure 8 illustrates exemplary messages that may be exchanged between event manager coordinator **400** and message correlator **110** in assigning an event manager to a particular subscriber. Referring to Figure 8, in step A, message correlator **110** sends a location query message to event manager coordinator **400** requesting the location of a subscriber record. In step B, event manager coordinator **400** responds with an IP address of an event manager assigned to the subscriber. Once an event manager has been assigned, event manager coordinator **400** is no longer involved in communications between correlator **110** and the event manager.

In step C, correlator **110** delivers messages to the assigned event manager. In step D, subsequent data deliveries regarding the same subscriber may be sent directly from message correlator **110** to event manager **112** based on a local cache **702** of event manager information for the subscriber.

Figure 9 is a message flow diagram illustrating the delivery of messages from a message correlator to an event manager according to an embodiment of the subject matter described herein. Referring to Figure 9, in line 1 of the message flow diagram, message correlator **110** queries event manager coordinator **400** for the location of a subscriber corresponding to the directory number 111-111-1111. In line 2 of the message flow diagram, event manager coordinator **400** determines that the subscriber is unassigned and assigns an event manager. In line 3 of the message flow diagram, event manager coordinator **400** sends the event manager IP address, IMSI, MSISDN, and MIN values to the querying message correlator. Message correlator **110** preferably

remembers the assignment for this subscriber. In line 4 of the message flow diagram, event manager coordinator **400** sends message data and the IMSI, MIN, and MSISDN number directly to event manager **112**. Event manager **112** creates a database entry for the subscriber and processes the event. For example, event manager coordinator may determine whether the message data indicates a change in status for a subscribed-to presentity. If the message data indicates a change in presence status regarding a subscribed-to presentity, event manager **112** may inform a presence server of the new presence status for the subscribed-to presentity.

Figure 10 is a message flow diagram illustrating exemplary steps for notifying a message correlator that an event manager is not a subscriber of a particular network. Referring to Figure 10, in line 1, message correlator **110** queries event manager coordinator **400** for the location of a subscriber corresponding to the subscriber identifier 111-111-1111. In line 2 of the message flow diagram, event manager coordinator **400** queries its presentity database and determines that the subscriber is not a subscriber or customer of the particular carrier. Accordingly, in line 3 of the message flow diagram, event manager coordinator **400** responds with an invalid subscriber message. In line 4 of the message flow diagram, message correlator **110** deletes the message data.

Figure 11 is a message flow diagram illustrating exemplary messages exchanged in communicating messages containing presence status information for a presentity to an assigned event manager. Referring to Figure 11, in line 1, message correlator **110** determines presence information needs to be delivered to an event manager and remembers the event manager location for the particular subscriber. This step may be performed after a previous location query for the same subscriber. In line 2 of the message flow diagram, message correlator **110** sends the message data directly to event manager **112**, bypassing event manager coordinator **400**. In line 3 of the message flow diagram, event manager **112** processes the new data. Accordingly, Figure 11 illustrates that by caching event manager assignment information, message correlators **110** can reduce the flow of query messages in the network.

Figure 12 is a message flow diagram illustrating exemplary messages exchanged between a presence server and an event manager coordinator in subscribing to presentity data stored by an event manager. Referring to Figure 12, in line 1, presence server **104** sends a SIP subscribe message to event manager coordinator **400**. The SIP subscribe message requests presence information regarding a subscriber corresponding to subscriber identifier 111-111-1111. In line 2 of the message flow diagram, event manager coordinator **400** looks up the event manager location for the subscriber. In line 3 of the message flow diagram, event manager coordinator sends a SIP redirect message to presence server **104** redirecting the presence server to the event manager assigned to the subscriber. In an alternate scenario, the event manager coordinator could proxy the subscribe message to the correct event manager. The 200 OK response from the event manager would contain its address information which the presence server may then remember for future direct communications. This eliminates the need for the extra subscribe sent at line 5.

In line 4 of the message flow diagram, presence server **104** may remember the event manager address for subsequent use. In line 5 of the message flow diagram, presence server **104** sends a redirected subscribe message to the event manager assigned to the subscriber. In line 6 of the message flow diagram, event manager **112** sends a notify message containing presence information regarding the subscriber to presence server **104**. Event manager **112** may send subsequent notifies to the subscribing presence server when subscriber's presence status changes.

As a number of subscribers in a network increases, it may be desirable to add event manager nodes. Once event manager nodes are added, there must be some mechanism for allocating subscribers to each newly added event manager. Once possible solution is to keep existing subscribers with their current event managers and start using the new event manager for new subscribers. This could be accomplished relatively easily because event manager coordinator **400** may be configured to automatically assign subscribers to the least busy event manager as described above. Since the new event manager is initially unutilized, new subscribers will be allocated to

that event manager until its utilization level becomes equal to that of the existing event managers.

In an alternate implementation, existing subscribers may be rebalanced among event managers when a new event manager is added. Rebalancing or reassigning existing subscribers to new event managers may include copying current presence information from a source event manager to a new event manager, informing the presence server that the subscriber has moved, informing all message correlators that the subscriber has moved, and deleting presence information from the old event manager. Copying presence information may include selecting subscribers to be reassigned based on arithmetic formula designed to equally distribute subscribers over the total number of event managers. Informing the presence servers of new assignments may include determining if there are any active subscriptions for the reassigned presentity and sending a notify message to each presence server that is subscribed to the presentity. The notify message preferably has a subscription state header value of terminated and a reason code of deactivated, which will cause the presence server to clear the current subscription and immediately attempt a resubscribe message to the event manager coordinator where the presence server will be redirected to the newly assigned event manager location.

Figure 13 is a message flow diagram illustrating exemplary messages exchanged in dynamically rebalancing subscribers among event managers when a new event manager is added according to an aspect of the subject matter described herein. Referring to Figure 13, in line 1 of the message flow diagram, an operator sends a rebalance command to event manager coordinator. In Figure 13, it is assumed that event manager 3 is newly added. In line 2 of the message flow diagram, event manager coordinator **400** sends a message to event manager 1 indicating that it should copy one third of its presentities to event manager 3. In line 3 of the message flow diagram, event manager 1 copies one third of its presentities to event manager 3.

In line 4 of the message flow diagram, event manager coordinator **400** sends a message to event manager 2 requesting that event manager 2 copy one third of its presentities to event manager 3. In line 5 of the message flow

diagram, event manager 2 copies one third of its presentities to event manager 3.

In line 6 of the message flow diagram, event manager coordinator **400** updates its assignment database for the subscribers that have been copied to event manager 3. In line 7 of the message flow diagram, event manager coordinator **400** sends reallocation notification messages to each message correlator. In line 8 of the message flow diagram, each message correlator updates its local assignment cache to indicate the event manager to which it should send messages. In line 9 of the message flow diagram, each event manager **112** from which subscribers were transferred (EM1 and EM2) sends a notify message to the presence servers indicating that the subscriptions for the transferred subscribers have been terminated. In line 10 of the message flow diagram, the presence server subscribes to these subscribers. In line 11 of the message flow diagram, event manager coordinator **400** redirects the presence servers to the event manager to which the subscribers have been moved. In line 12 of the message flow diagram, the presence servers subscribe to the event managers to which they were redirected.

Thus, the subject matter described herein includes methods, systems, and computer program products for dynamically coordinating the collection and distribution of presence information. The subject matter described herein can be used to coordinate the collection of presence information by any number of event managers and the distribution of that information to any number of presence servers. As a result, presence gateway architectures can be scaled as the number of subscribers increases.

In the examples described above, the event manager coordinator dynamically assigns event managers to subscriber records and communicates the event manager identity to message correlators and to presence servers. Communicating event manager identities to message correlators is useful in 2G and 2.5G networks where presence information is derived from signaling messages. However, the subject matter described herein is not limited to coordinating the collection and distribution of presence information in 2G and 2.5G networks. For example, a presence gateway coordinator according to an embodiment of the subject matter described herein may also be capable of

coordinating the collection and distribution of presence information in 3G networks and in networks that use 2G, 2.5G, and 3G methods for collecting presence information.

In 3G networks, some GPRS handsets include presence clients that collect presence information regarding their respective users. Each handset may be programmed with the location of an event manager coordinator from which the handset requests the location of an assigned event manager. The presence gateway coordinator may inform the handset of the location of the event manager in the manner described above. The handset may then deliver its presence information to the assigned event manager.

It will be understood that various details of the invention may be changed without departing from the scope of the invention. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation, as the invention is defined by the claims as set forth hereinafter.

CLAIMS

What is claimed is:

1. A method for dynamically coordinating collection and distribution of presence information, the method comprising:
   (a) collecting presence information regarding a presentity;
   (b) dynamically assigning a presence gateway event manager from a plurality of presence gateway event managers to the presentity; and
   (c) transmitting the presence information regarding the presentity to the assigned event manager.
2. The method of claim 1 wherein collecting presence information regarding a presentity includes correlating signaling messages regarding the presentity at a message correlator and deriving the presence information from the correlated signaling messages.
3. The method of claim 2 wherein dynamically assigning a presence gateway event manager to the subscriber includes maintaining event manager resource utilization information regarding the event managers, assigning an event manager to the presentity based on the resource utilization information, and informing the message correlator of the assigned event manager.
4. The method of claim 3 comprising caching presence gateway event manager identification information for the presentity at the message correlator.
5. The method of claim 4 comprising, at the message correlator, sending the presence information regarding the presentity to the event manager using the cached location information.
6. The method of claim 1 wherein collecting presence information includes collecting presence information from a general packet radio service (GPRS) handset.
7. The method of claim 1 wherein dynamically assigning a presence gateway event manager includes:
   (a) receiving a subscription request from a presence server;

(b) determining whether the presentity is currently assigned to an event manager; and

(c) in response to determining that the presentity is not assigned to an event manager, assigning an event manager, and redirecting the presence server to the assigned event manager.

8. The method of claim 7 wherein redirecting the presence server to the event manager includes sending a SIP redirect message to the presence server.

9. The method of claim 8 comprising, at the presence server, after receiving the redirect message, sending a subscription request to the assigned event manager.

10. The method of claim 7 wherein redirecting the presence server to the assigned event manager includes proxying the subscription request to the assigned event manager.

11. The method of claim 7 comprising caching the event manager identity at the presence server and using the cached event manager identity to obtain presence information regarding the presentity from the event manager.

12. A method for rebalancing subscribers among presence gateway event managers, the method comprising:

(a) providing a first presence gateway event manager for storing subscriber records including presence information for a plurality of subscribers and for communicating the presence information to a presence server;

(b) adding a second presence gateway event manager to a network; and

(c) dynamically allocating subscriber records to the second present gateway event manager.

13. The method of claim 12 wherein dynamically allocating subscriber records to the second present gateway event manager comprises allocating new subscriber records to the first or second present gateway event managers based on relative resource utilization of the first and second presence gateway event managers.

14. The method of claim 12 wherein dynamically allocating subscriber records to the second presence gateway event manager includes transferring at least some of the subscriber records from the first presence gateway event manager to the second presence gateway event manager.

15. The method of claim 14 comprising, after transferring the subscriber records from the first presence gateway event manager to the second presence gateway event manager, notifying a presence server of the transferred subscriber records.

16. The method of claim 15 wherein notifying a presence server of the transferred subscriber records includes terminating presence server subscriptions to the transferred subscriber records, receiving subscribe messages from the presence server for the transferred subscriber records, redirecting the presence server to the second presence gateway event manager, and receiving new subscribe messages regarding the transferred subscriber records from the presence server at the second presence gateway event manager.

17. A system for dynamically coordinating collection and distribution of presence information, the system comprising:

(a) a correlator for correlating signaling messages regarding a presentity and deriving presence information regarding the presentity based on the signaling messages;

(b) a plurality of event managers for receiving presence information from the correlator; and

(c) an event manager coordinator for dynamically assigning one of the event managers for receiving the presence information regarding the presentity.

18. The system of claim 17 wherein the correlator is adapted to correlate SS7 signaling messages regarding the presentity.

19. The system of claim 17 wherein the correlator is adapted to correlate IP telephony signaling messages regarding the presentity.

20. The system of claim 17 wherein the event managers are adapted to communicate resource utilization data to the event manager coordinator

and wherein the event manager coordinator is adapted to utilize relative resource utilization data in assigning the event manager to the presentity.

21. The system of claim 17 wherein the event manager coordinator is adapted to dynamically assign the event manager based on request message from the correlator.

22. The system of claim 17 wherein the presence gateway coordinator is adapted to dynamically assign the event manager based on a subscription message from a presence server.

23. A computer program product comprising computer-executable instructions embodied in a computer-readable medium for performing steps comprising:

(a) collecting presence information for a presentity;

(b) dynamically assigning a presence gateway event manager from a plurality of presence gateway event managers to the presentity; and

(c) transmitting presence information regarding the presentity to the assigned event manager.

24. The computer program product of claim 23 wherein collecting presence information for a presentity includes correlating signaling messages regarding the presentity at a message correlator and deriving the presence information from the correlated signaling messages.

25. The computer program product of claim 23 wherein dynamically assigning a presence gateway event manager to the subscriber includes maintaining event manager resource utilization information regarding the event managers, assigning an event manager to the presentity based on the resource utilization information, and informing the message correlator of the assigned event manager.

26. The computer program product of claim 25 comprising caching presence gateway event manager identification information for the presentity at the message correlator.

27. The computer program product of claim 25 comprising, at the message correlator, sending the presence information regarding the presentity to the event manager using the cached location information.

28. The computer program product of claim 23 wherein collecting presence information includes collecting presence information from a general packet radio service (GPRS) handset.

29. The computer program product of claim 23 wherein dynamically assigning a presence gateway event manager includes:

(a) receiving a subscription request from a presence server;

(b) determining whether the presentity is currently assigned to an event manager; and

(c) in response to determining that the presentity is not assigned to an event manager, assigning an event manager, and redirecting the presence server to the assigned event manager.

30. The computer program product of claim 29 wherein redirecting the presence server to the event manager includes sending a SIP redirect message to the presence server.

31. The computer program product of claim 29 comprising, at the presence server, after receiving the redirect message, sending a subscription request to the event manager.

32. The computer program product of claim 28 wherein redirecting the presence server to the event manager includes proxying the subscription request to assigned event manager.

33. The computer program product of claim 28 comprising caching the event manager identity at the presence server and using the cached event manager identity to obtain presence information regarding the presentity from the event manager.

34. A computer program product comprising computer-executable instructions embodied in a computer-readable medium for performing steps comprising:

(a) providing a first presence gateway event manager for storing subscriber records including presence information for a plurality

of subscribers and for communicating the presence information to a presence server;

(b) adding a second presence gateway event manager to a network; and

(c) dynamically allocating subscriber records to the second present gateway event manager.

35. The computer program product of claim 34 wherein dynamically allocating subscriber records to the second present gateway event manager comprises allocating new subscriber records to the first or second present gateway event managers based on relative resource utilization of the first and second presence gateway event managers.

36. The computer program product of claim 34 wherein dynamically allocating subscriber records to the second presence gateway event manager includes transferring at least some of the subscriber records from the first presence gateway event manager to the second presence gateway event manager.

37. The computer program product of claim 36 comprising, after transferring the subscriber records from the first presence gateway event manager to the second presence gateway event manager, notifying a presence server of the transferred subscriber records.

38. The computer program product of claim 37 wherein notifying a presence server of the transferred subscriber records includes terminating presence server subscriptions to the transferred subscriber records, receiving subscribe messages from the presence server for the transferred subscriber records, redirecting the presence server to the second presence gateway event manager, and receiving new subscribe messages regarding the transferred subscriber records from the presence server at the second presence gateway event manager.

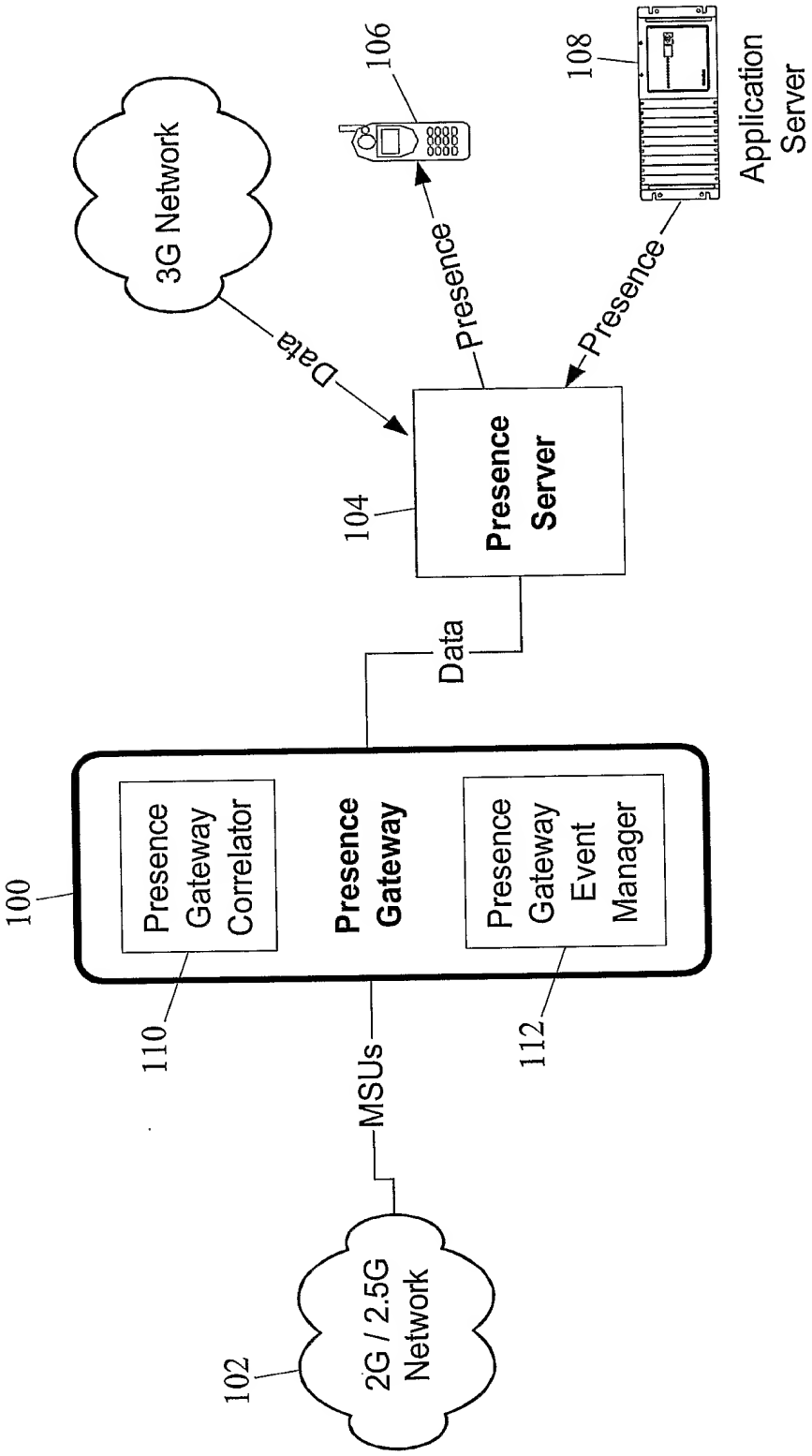
3G Network
106
108
Application Server
Data
Presence
Presence
Presence Server
104
Data
100
Presence Gateway Correlator
Presence Gateway
Presence Gateway Event Manager
110
MSUs
112
102
2G / 2.5G Network

FIG. 1

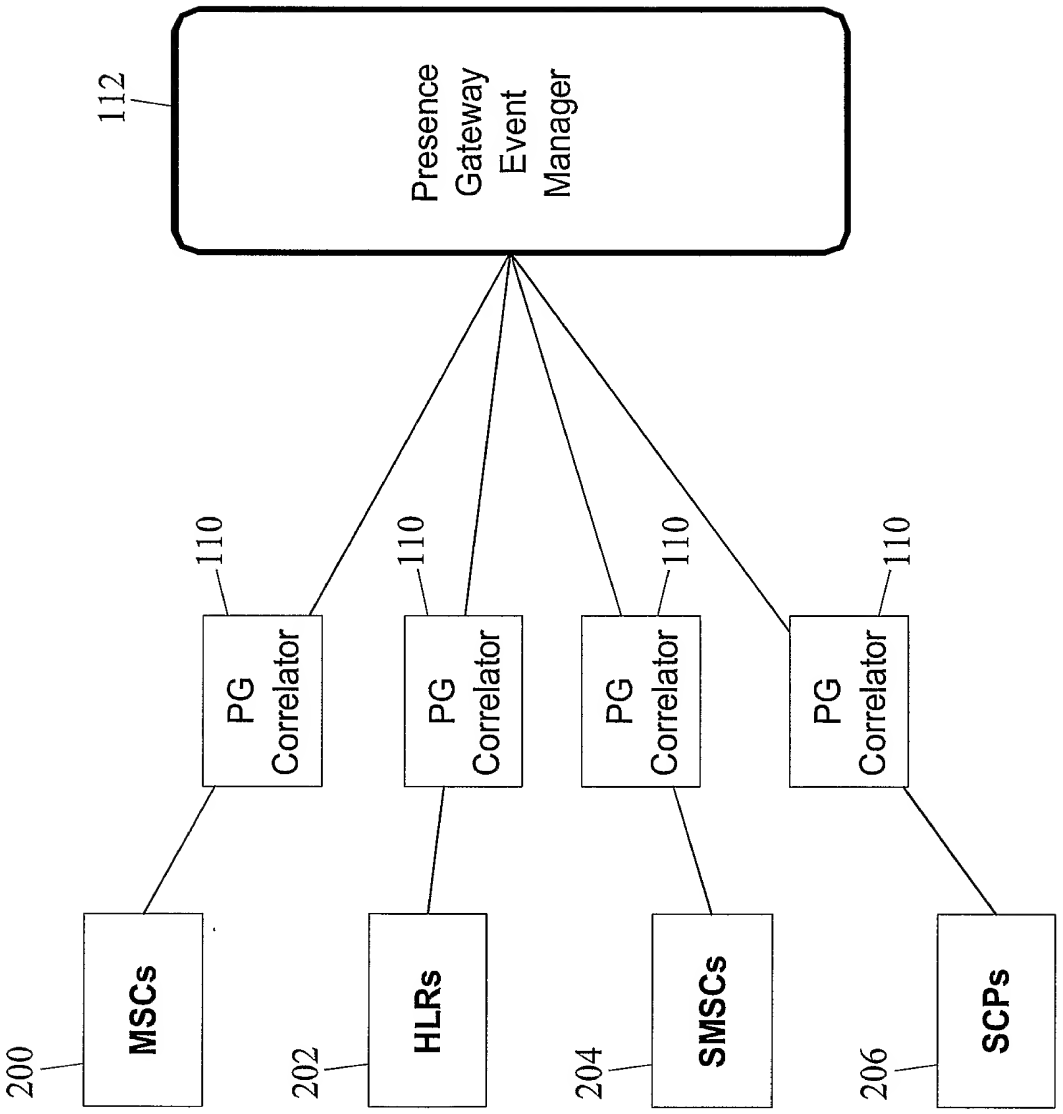
112
Presence Gateway Event Manager
110
PG Correlator
110
PG Correlator
110
PG Correlator
110
PG Correlator
200
MSCs
202
HLRs
204
SMSCs
206
SCPs

FIG. 2

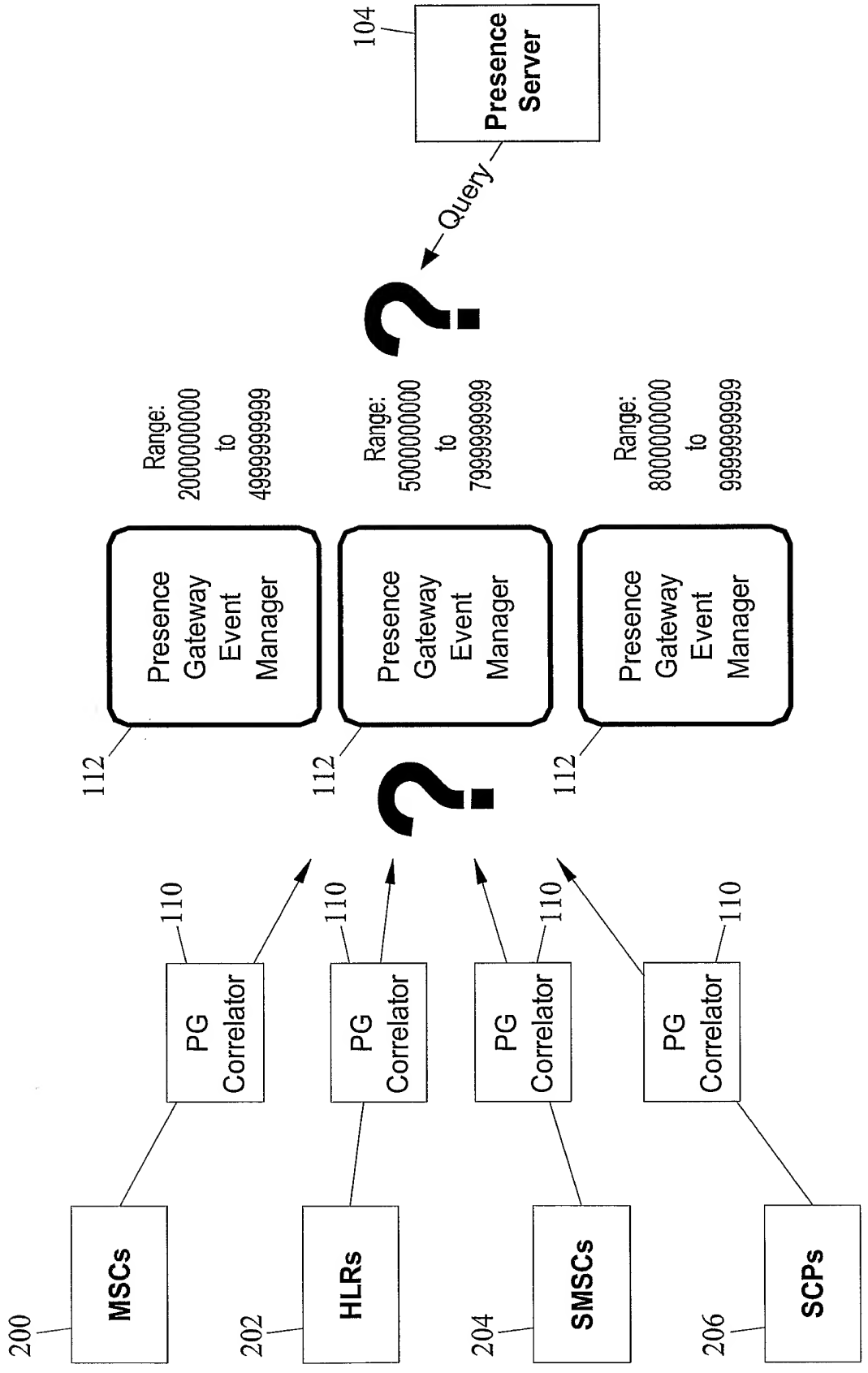
104
Presence Server
Query
?
Range: 2000000000 to 4999999999
Range: 5000000000 to 7999999999
Range: 8000000000 to 9999999999
Presence Gateway Event Manager
Presence Gateway Event Manager
Presence Gateway Event Manager
112
112
112
?
110
110
110
110
PG Correlator
PG Correlator
PG Correlator
PG Correlator
200
MSCs
202
HLRs
204
SMSCs
206
SCPs

FIG. 3

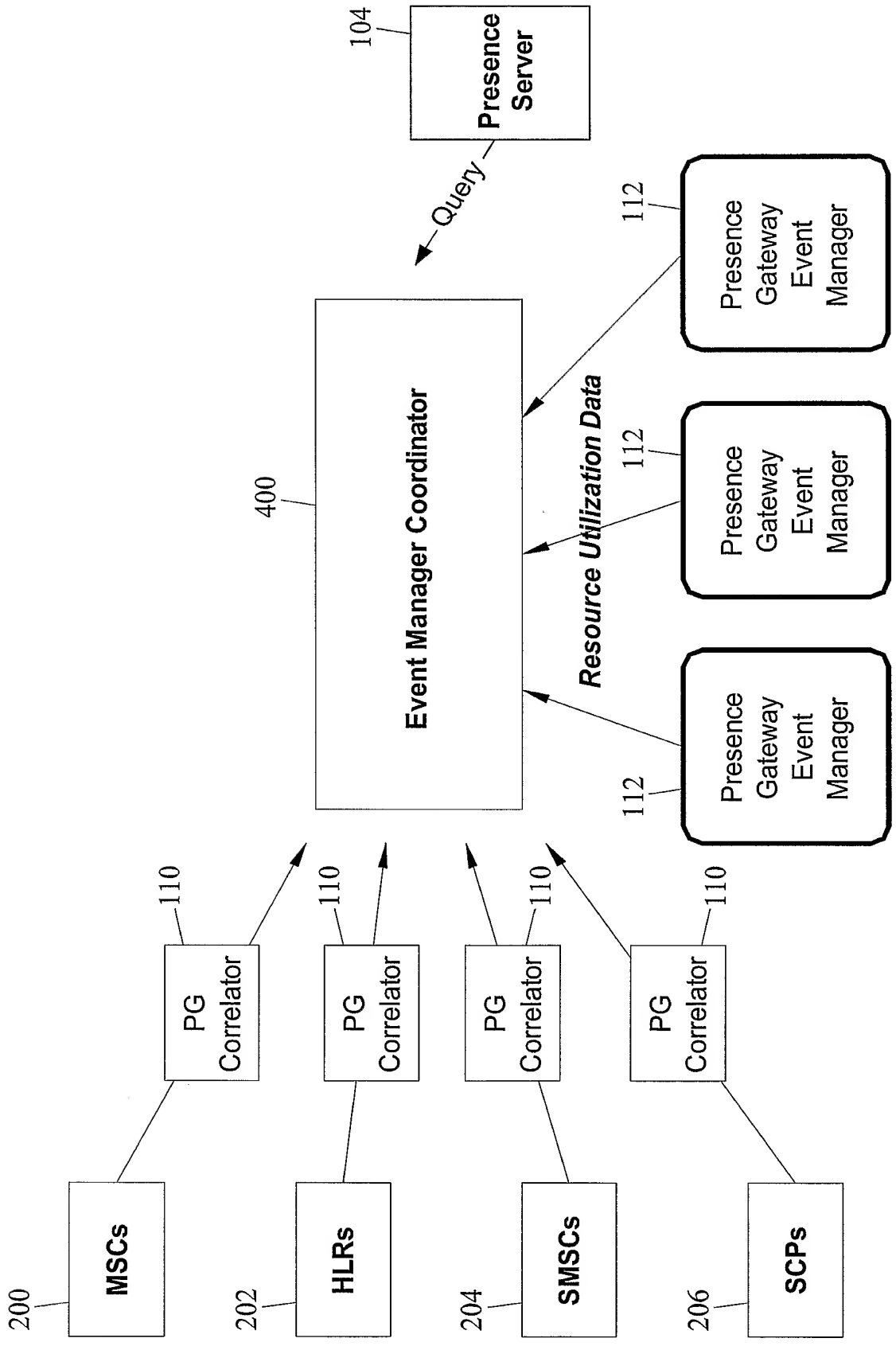
104
Presence Server
Query
112
Presence Gateway Event Manager
112
Presence Gateway Event Manager
112
Presence Gateway Event Manager
400
Event Manager Coordinator
Resource Utilization Data
110
PG Correlator
110
PG Correlator
110
PG Correlator
110
PG Correlator
200
MSCs
202
HLRs
204
SMSCs
206
SCPs

FIG. 4

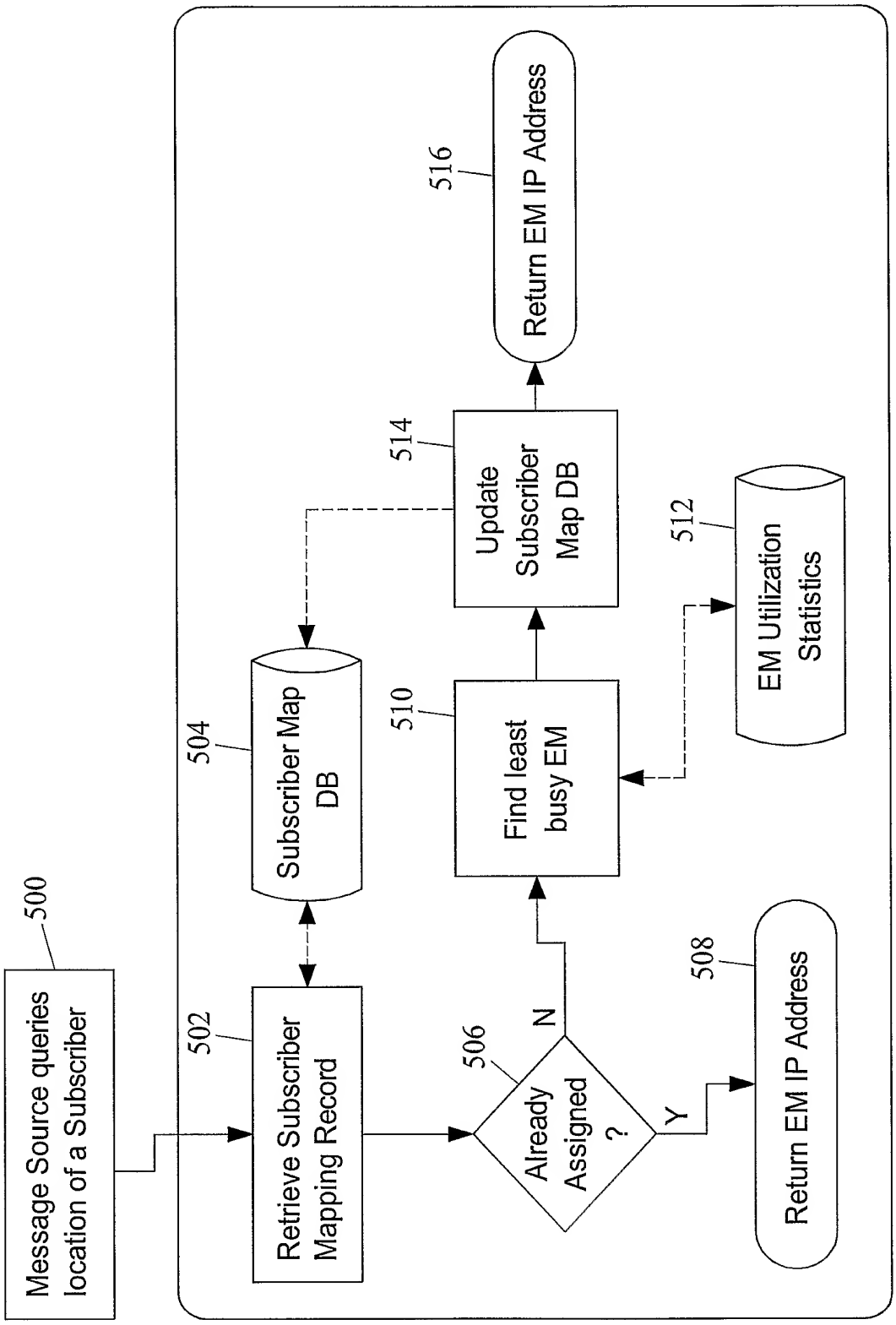
Message Source queries location of a Subscriber
500
Retrieve Subscriber Mapping Record
502
Subscriber Map DB
504
Already Assigned ?
506
N
Y
Return EM IP Address
508
Find least busy EM
510
EM Utilization Statistics
512
Update Subscriber Map DB
514
Return EM IP Address
516

FIG. 5

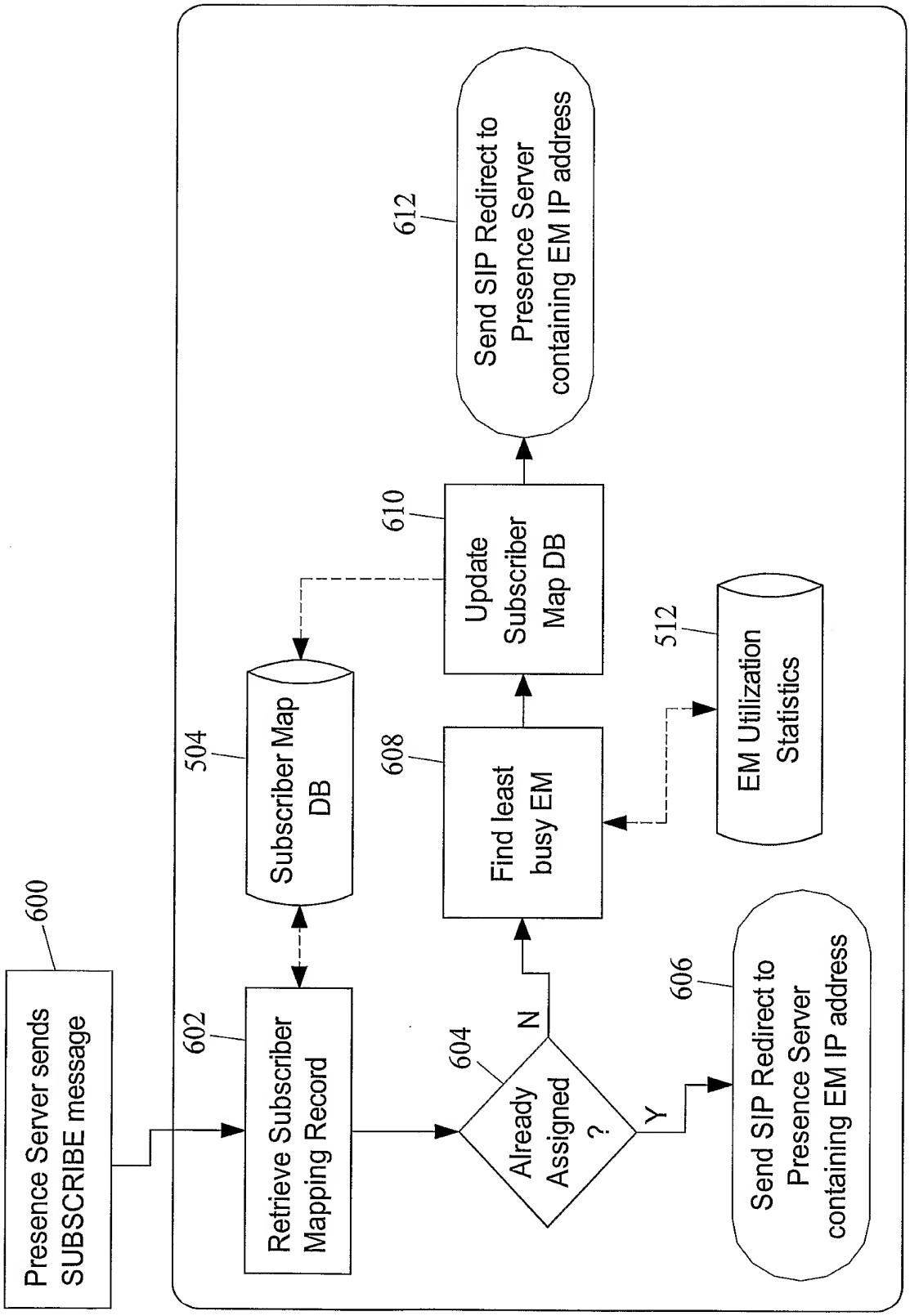
Presence Server sends SUBSCRIBE message
600
Retrieve Subscriber Mapping Record
602
Subscriber Map DB
504
Already Assigned ?
604
N
Y
Find least busy EM
608
Update Subscriber Map DB
610
Send SIP Redirect to Presence Server containing EM IP address
612
Send SIP Redirect to Presence Server containing EM IP address
606
EM Utilization Statistics
512

FIG. 6

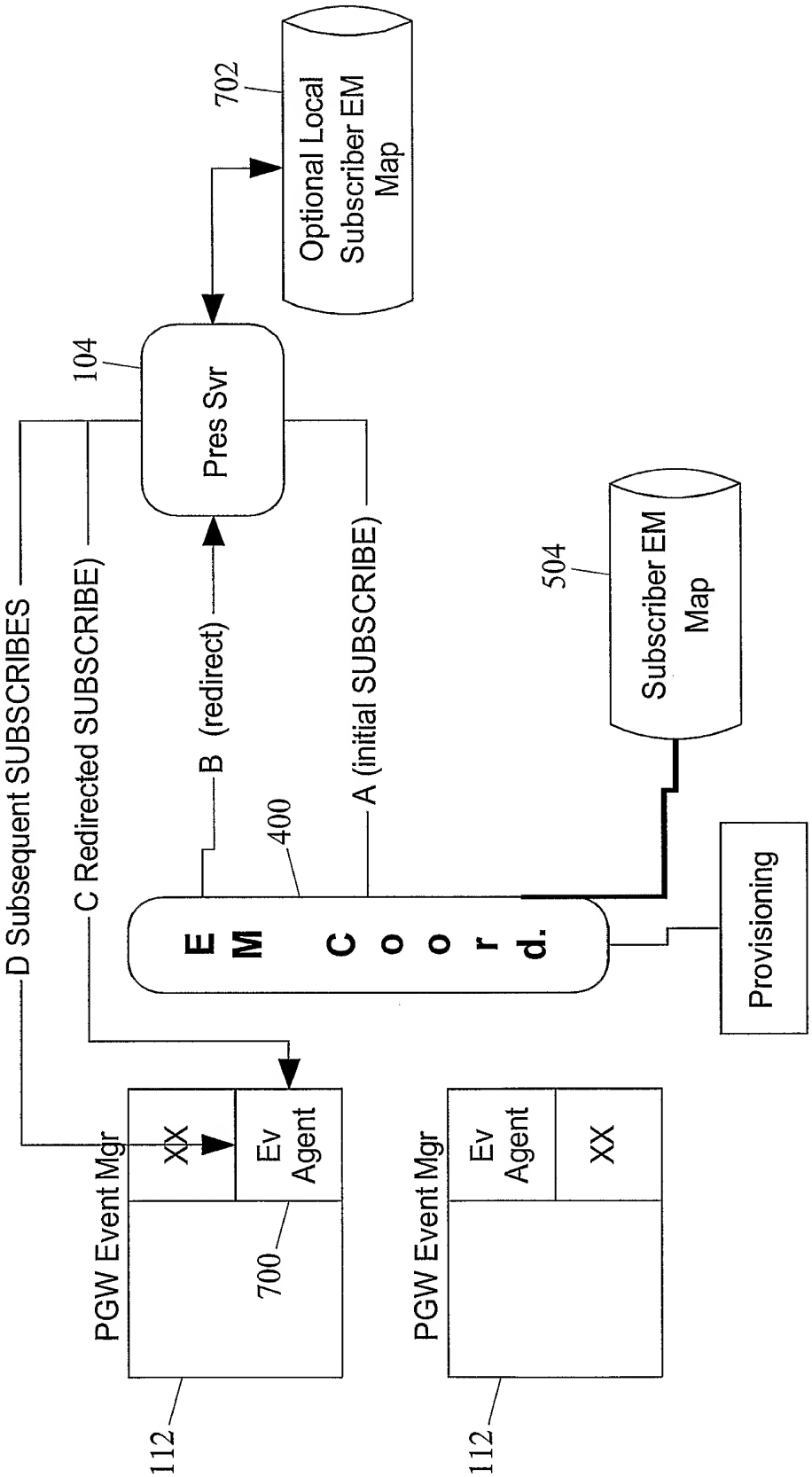
Optional Local Subscriber EM Map
702
Pres Svr
104
D Subsequent SUBSCRIBES
C Redirected SUBSCRIBE)
B (redirect)
A (initial SUBSCRIBE)
400
EM Coord.
Subscriber EM Map
504
Provisioning
PGW Event Mgr
XX
Ev Agent
700
112
PGW Event Mgr
Ev Agent
XX
112

FIG. 7

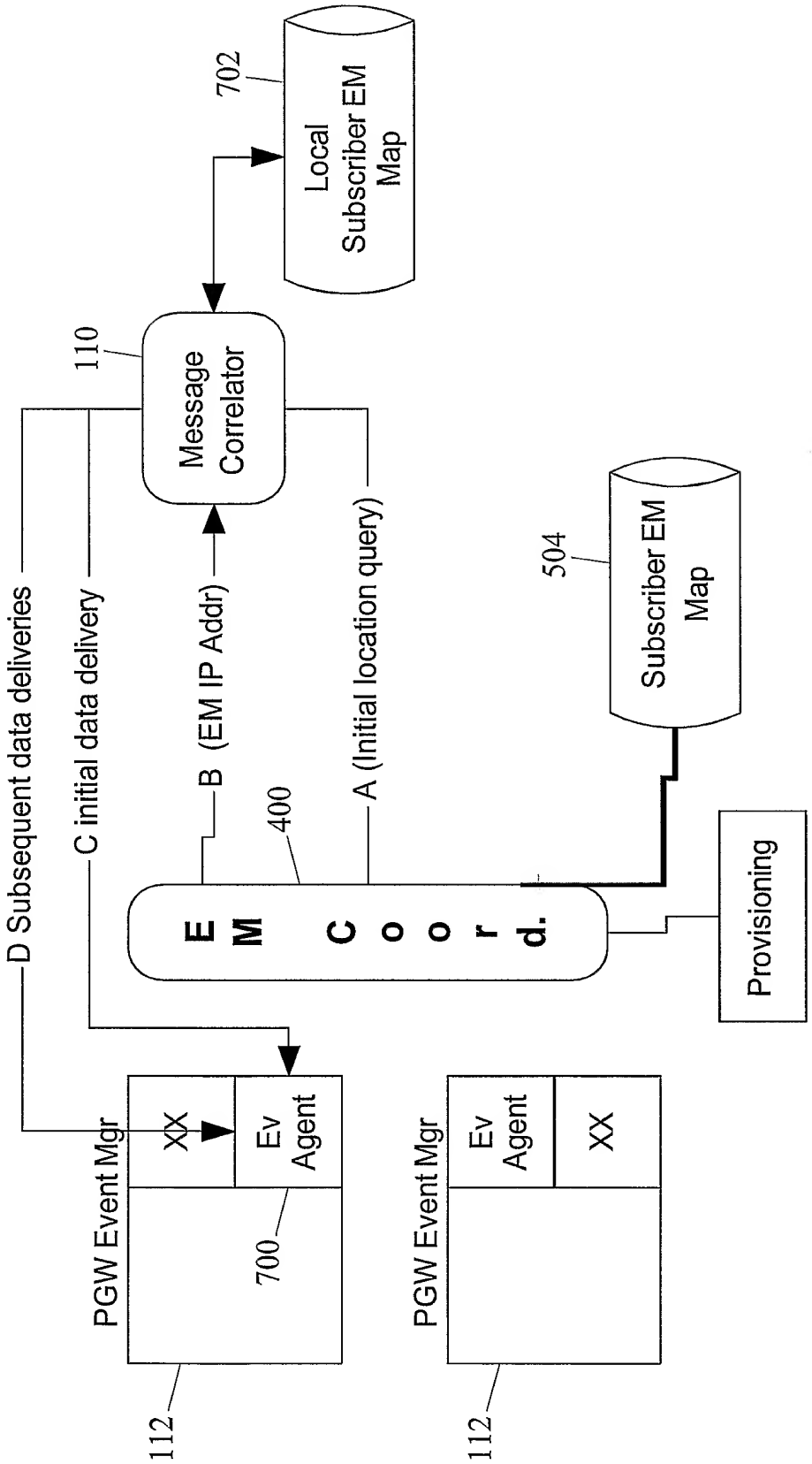
Local Subscriber EM Map
702
Message Correlator
110
D Subsequent data deliveries
C initial data delivery
B (EM IP Addr)
A (Initial location query)
400
EM Coord.
Subscriber EM Map
504
Provisioning
PGW Event Mgr
XX
Ev Agent
700
112
PGW Event Mgr
Ev Agent
XX
112

FIG. 8

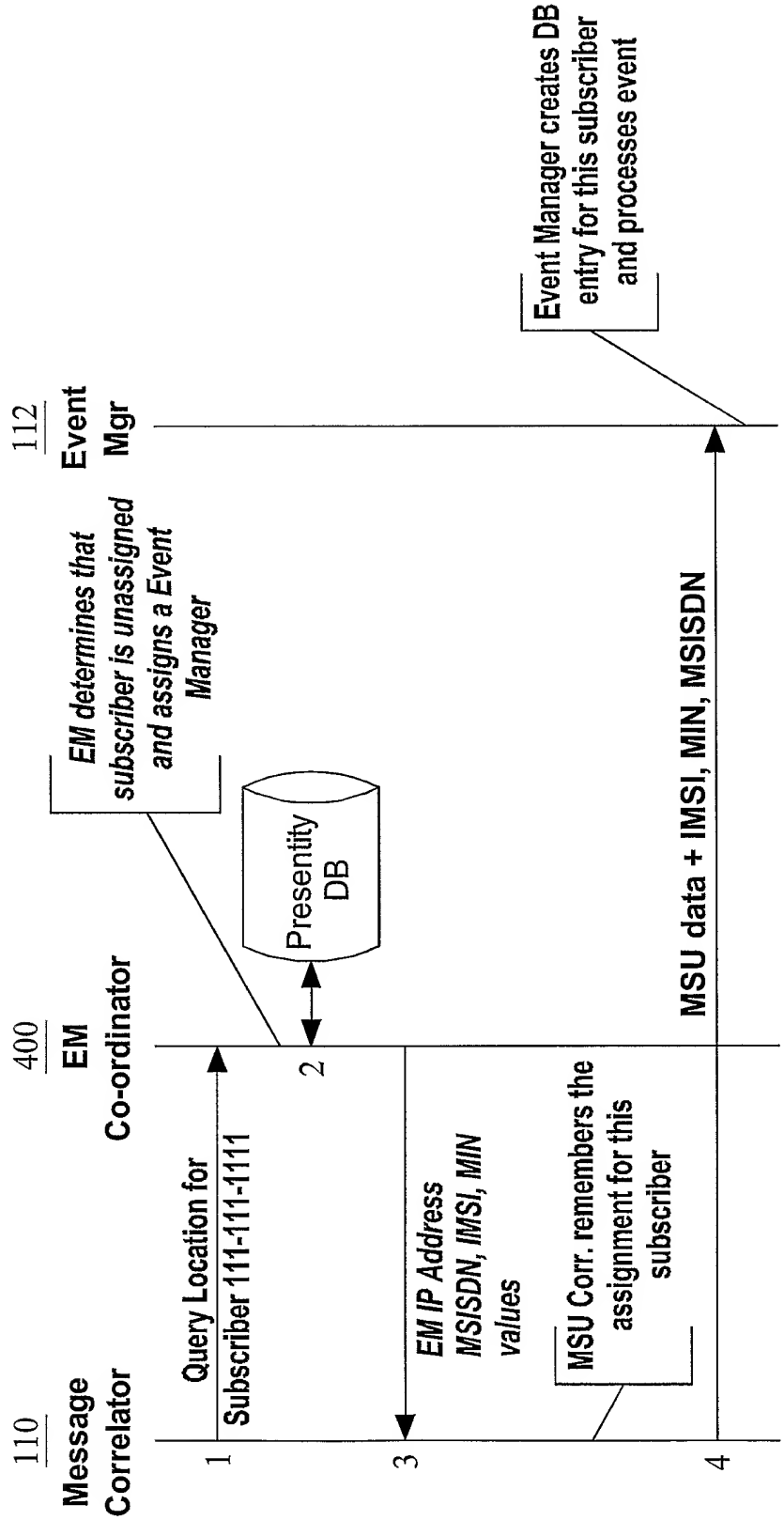
110
Message Correlator
400
EM Co-ordinator
112
Event Mgr
Query Location for Subscriber 111-111-1111
1
EM determines that subscriber is unassigned and assigns a Event Manager
2
Presentity DB
EM IP Address MSISDN, IMSI, MIN values
3
MSU Corr. remembers the assignment for this subscriber
MSU data + IMSI, MIN, MSISDN
4
Event Manager creates DB entry for this subscriber and processes event

FIG. 9

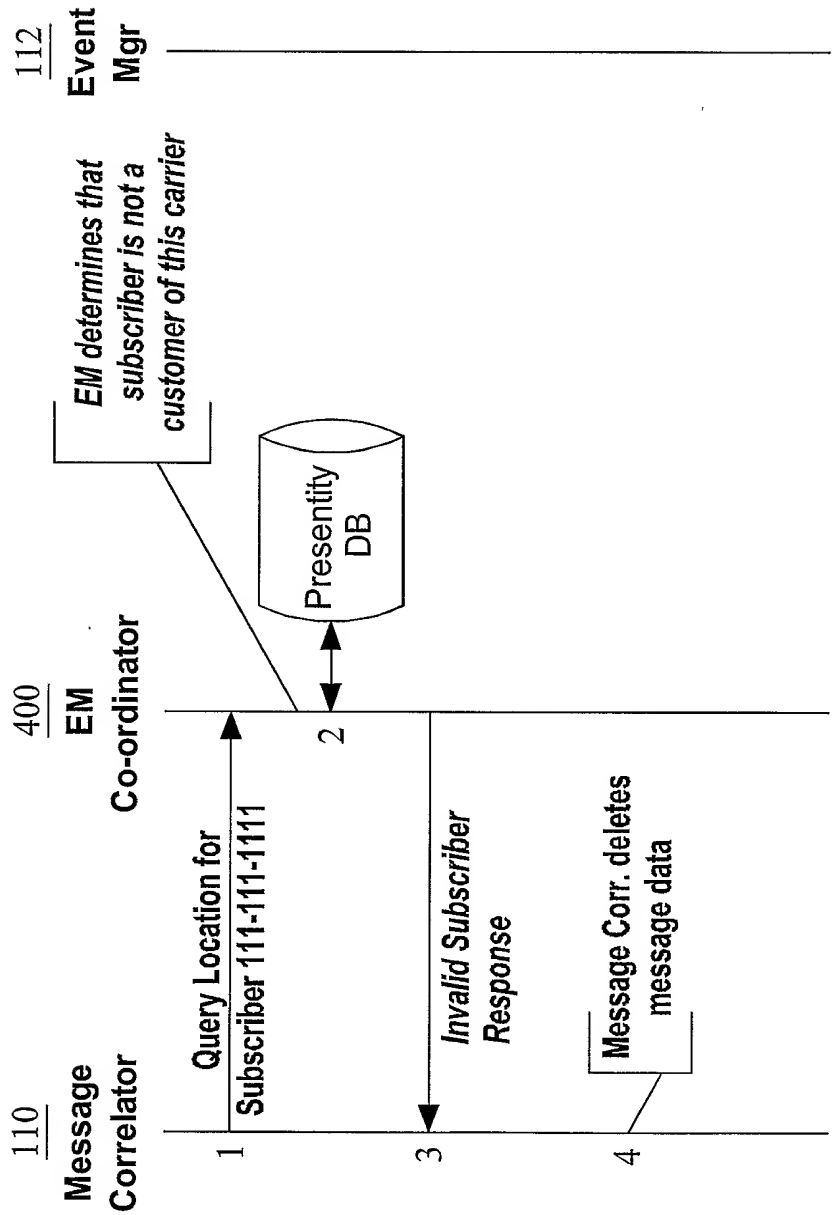
110
Message Correlator
400
EM Co-ordinator
112
Event Mgr
Query Location for Subscriber 111-111-1111
1
2
EM determines that subscriber is not a customer of this carrier
Presentity DB
3
Invalid Subscriber Response
4
Message Corr. deletes message data

FIG. 10

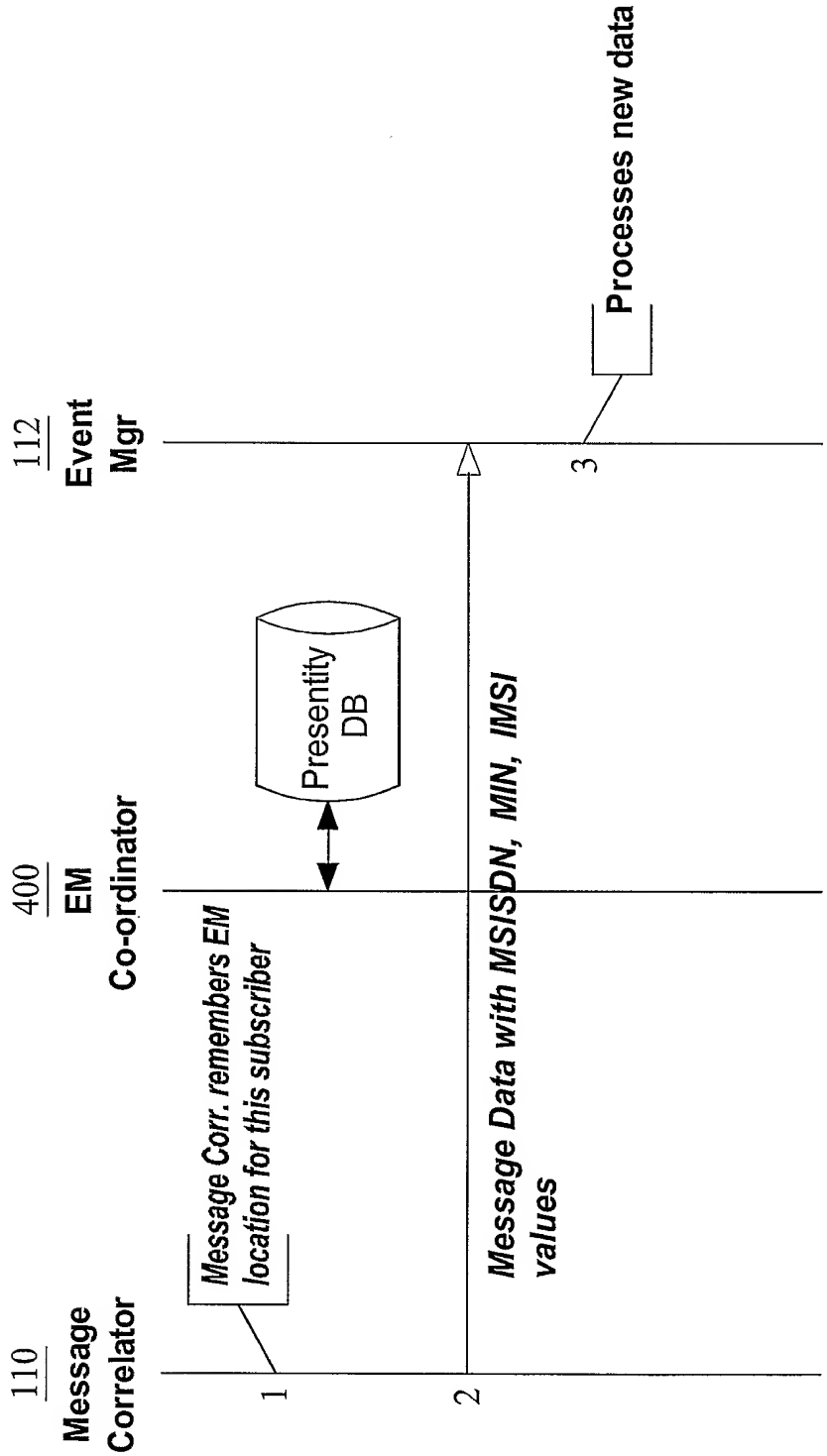
110
Message Correlator
400
EM Co-ordinator
112
Event Mgr
Message Corr. remembers EM location for this subscriber
Presentity DB
Message Data with MSISDN, MIN, IMSI values
Processes new data
1
2
3

FIG. 11

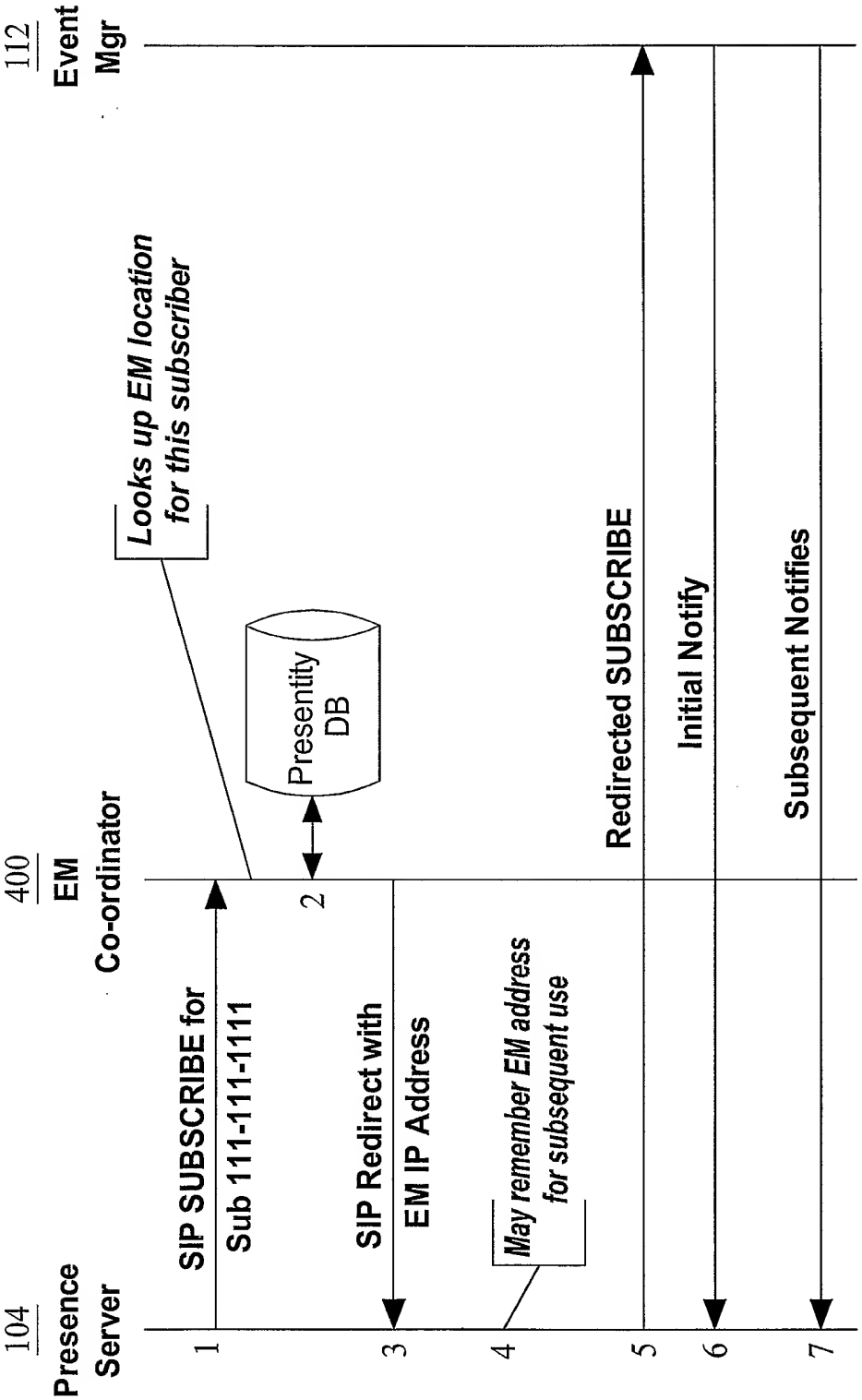
104
Presence Server
400
EM Co-ordinator
112
Event Mgr
SIP SUBSCRIBE for Sub 111-111-1111
Looks up EM location for this subscriber
Presentity DB
SIP Redirect with EM IP Address
May remember EM address for subsequent use
Redirected SUBSCRIBE
Initial Notify
Subsequent Notifies
1
2
3
4
5
6
7

FIG. 12

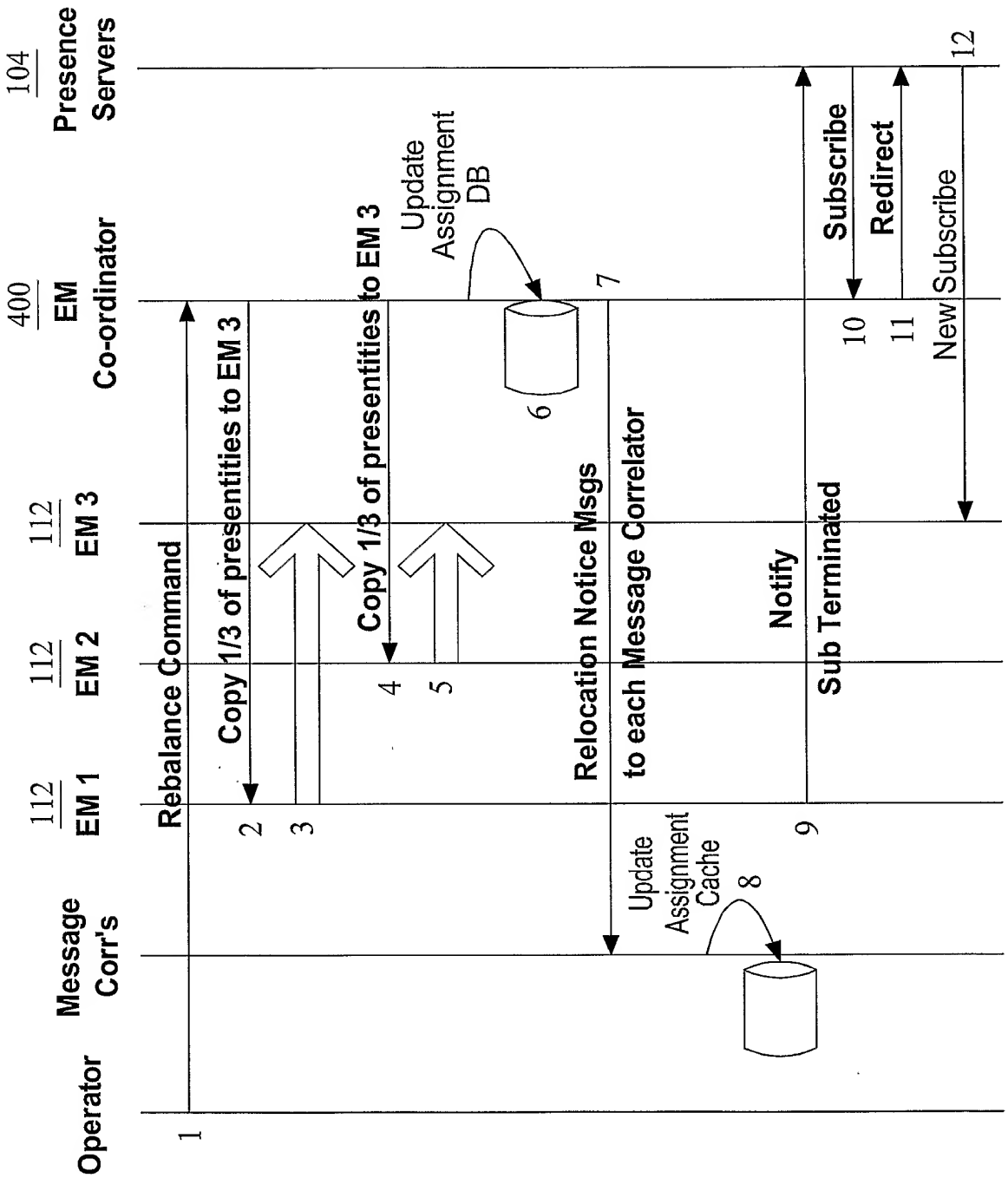
Operator
Message Corr's
112 EM 1
112 EM 2
112 EM 3
400 EM Co-ordinator
104 Presence Servers
Rebalance Command
Copy 1/3 of presentities to EM 3
Copy 1/3 of presentities to EM 3
Update Assignment DB
Relocation Notice Msgs to each Message Correlator
Update Assignment Cache
Notify
Sub Terminated
Subscribe
Redirect
New Subscribe
1
2
3
4
5
6
7
8
9
10
11
12

FIG. 13